Claims

1. A process for the conversion of sludges and carbonaceous materials, characterised in that the process comprises the steps of:

(a) (d) Heating the material to be converted whilst being conveyed through a heating zone of a reactor in the absence of oxygen for the volatilisation of oil producing vapours, thereby producing both a vapour product and a solid residue or char;

(b) (e) Contacting the vapour product and char whilst conveying that char through a reaction zone of the reactor at a determined Weight Hour Space Velocity ("WHSV") so as to promote vapour-phase catalytic reactions; and

(c) (f) Removing and separating the gaseous products and char from the reactor,

wherein the material and the resulting char are conveyed by way of a non-positive conveyor, and less than 5% of the material to be converted is passed from the reactor in a time less than that required to heat it to a temperature of more than about 400°C.

2. A process according to claim 1, wherein the gaseous products from the reactor are condensed to produce oil and water.

3. A process according to claim 2, wherein the oil and water are then separated and the oil polished to remove char fines and any free water.

4. A process according to any one of claims 1 to 3, wherein the inventory of char within the reactor is able to be adjusted to provide the required WHSV in the reaction zone of the reactor.

5. A process according to any one of the preceding claims, wherein the heating rate in the heating zone is between about 5 and 30°C/min.

6. A process according to any one of the preceding claims, wherein the material is conveyed through the heating and reaction zones by a conveyor having a rotational speed of at least about 1 rpm.

7. A process according to claim 6, wherein the conveyor is provided with paddles and rotates such that the paddle tip speed is between about 2 and 8 m/min.

8. A process according to any one of the preceding claims, wherein less than about 5% of the char inventory is passed through the reactor in less than about 40 minutes.

9. A process according to any one of the preceding claims, wherein dried sludge is fed to, and char removed from the reactor, by a means to ensure no ingress of air into the reactor, or egress of vapours from the reactor.

10. A process according to any one of the preceding claims, wherein the temperature of the reactor is about 400 to 450°C.

11. A process according to any one of the preceding claims, wherein the process further comprises the additional step of drying the material to be converted to less than 5% moisture prior to introduction to the reactor.

12. An apparatus for the conversion of sludges and carbonaceous materials, the apparatus characterised by comprising a reactor having a heating zone and a reaction zone and a means for conveying the material in a non-positive manner through both zones of the reactor in turn, the heating zone having a material inlet and the reaction zone having a material outlet and a gaseous product outlet, wherein there is further provided a retention means for retaining the material within the reactor such that a desired Weight Hour Space Velocity ("WHSV") for the material is achieved.

13. An apparatus according to claim 12, wherein the means for conveying material is a conveyor that allows a level of back mixing of the material being conveyed.

14. An apparatus according to claim 13, wherein the conveyor comprises in part an elongate shaft along at least a portion of the length of which are provided a plurality of paddles extending radially therefrom arranged to engage a bed of the material to be conveyed therethrough.

15. An apparatus according to claim 14, wherein the paddles are provided in a single row helical arrangement along the elongate shaft.

16. An apparatus according to claim 15, wherein the paddles overlap along the length of the shaft.

17. An apparatus according to any one of claims 14 to 16, wherein the paddles are spaced radially from adjacent paddles by between 30 to 90°.

18. An apparatus according to claim 17, wherein adjacent paddles are spaced apart by about 72°.

19. An apparatus according to any one of claims 14 to 18, wherein every second paddle is pitched at a back angle towards the material inlet.

20. An apparatus according to claim 19, wherein the back angle is about 10°.

21. An apparatus according to any one of claims 12 to 20, wherein the retention means is provided in the form of a weir.

22. An apparatus according to claim 21, wherein the weir is positioned within the reactor at a point immediately before the solids material outlet.

23. An apparatus according to claim 21 or 22, wherein the weir is tilted or rotated within the reactor with respect to the shaft of the conveyor so as to approximate the tilt or rotation of the bed of material provided therein.

24. An apparatus according to claim 23, wherein the weir is rotated through 30° to the horizontal.

25. An apparatus according to any one of claims 21 to 24, wherein the weir is adjustable in height.

26. A process for the conversion of sludges and carbonaceous materials substantially as hereinbefore described with reference to the accompanying figures.

27. An apparatus for the conversion of sludges and carbonaceous materials substantially as herein before described with reference to Figures 2 to 4, or Figures 6 to 8.